CONTE Summer Lab Experience Application

When preparing your application for funding from the CONTE Summer Lab Experience through the Undergraduate Program in Neuroscience, please read these instructions carefully. You may contact Ashley Hoesing, the UG Neuro Program Manager, with any questions at ahoesing@bu.edu or 617-358-3298.

An electronic version of this application is due to Ashley Hoesing (ahoesing@bu.edu) by noon on Tuesday, February 24, 2015. We cannot guarantee that application materials submitted after the deadline will be considered.

- Up to seven (7) students will be funded through the CONTE Summer Lab Experience. Funding includes:
  - Student Stipend: $4000
  - Student Food and Housing: <$3500
  - Research Supplies: <$400
  - Student Travel: $400

  * Funding Note: For students inside the Boston area, travel funds will cover travel to/from the Conte Center Fall Meeting; for students who choose to work in a CONTE lab outside their home institution, travel funds will cover travel to and from their summer institution.

- Grant number 1P50MH094263-01 from the National Institute of Mental Health is funding the Conte Summer Lab Experience.

- Be sure to print legibly on the application so that it may be accurately evaluated.

- This program will run from 6/1/15 – 8/7/15. Grantees are expected to work 35 hours per week in the lab during the entire 10 week period.

- Please submit completed application electronically to Ashley Hoesing (ahoesing@bu.edu)

- Name: ________________________________

- Year: ________________________________

- Faculty Sponsor: ______________________; ______________________; ______________________
Application Check List

Please mark each item to ensure a completed application and turn this sheet in with your final application no later than **noon on Tuesday, February 25, 2014**.

( ) Application Check List
( ) Statistical Data Collection Page (Not Required)
( ) General Information Page
( ) Lab Placement Selection Page
( ) Background Experience
( ) Personal Statement
( ) Academic and Professional Interest
( ) Safety Training Page
( ) University Transcript
Providing information on this page is strictly voluntary, and this page will not be included when your application is sent to reviewers. This data is collected solely for statistical purposes for reporting to agencies that request such data (including granting agencies that supply funding for this program) and for evaluating our program. This data will not be used in any way in conjunction with the application and award process. This page should be the first sheet in your application so our staff can remove it when your application is processed.

Please select your race/ethnicity: 
( ) African-American/Black  
( ) Asian  
( ) Caucasian/White  
( ) Hispanic/Latino  
( ) Native American  
( ) Pacific Islander  
( ) Other: ____________________________

Please select your immigration status: 
( ) US Citizen  
( ) US Permanent Resident (“Green Card”)  
( ) Foreign National/International Student

Please select your gender: 
( ) Female  
( ) Male

Please enter your GPA: 
____________/ 4.0  
____________/____________ if not based on 4.0 system
Name (First Last) ……………………

________________________________

Home Academic Institution…………

_____________________________________________________________

Full e-mail address ……………..

_____________________________________________________________

Major/Minor ………………………

_____________________________________________________________

Class Standing ……………………..

( ) Freshman

( ) Sophomore

( ) Junior

( ) Senior

What month and year will you receive your bachelor’s degree? …………………

_____________________________________________________________

Current phone number ……………

_____________________________________________________________

Current mailing address ……………

_____________________________________________________________

Will this be your first research experience? 

If no, please detail when, where, for how long, with whom you worked, and area of previous research……………………………

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Was this previous research experience through the CONTE Summer Lab Experience? If yes, with who? …………

_____________________________________________________________
Lab Placement Options

**Cohen Lab at The University of Illinois:**
Professor Neal Cohen’s project within the Conte Center combines neuropsychological studies of patients with brain damage together with neuroimaging studies of normal participants, thereby providing evidence both about the specific aspects of memory for which medial temporal-lobe (MTL) or prefrontal cortical (PFC) regions are necessary, and about the nature and timing of functional interactions between these regions. Professor Cohen’s Amnesia Research Laboratory, at the Beckman Institute for Advanced Science and Technology at the University of Illinois, uses a broad array of cognitive neuroscience methods, including neuropsychological, neuroimaging, electrophysiological, and eye tracking studies, together with computational modeling. His research on human learning and memory has been instrumental in identifying and characterizing multiple memory systems in the brain, and has emphasized development of novel methods and paradigms for assessment of different aspects and forms of memory. As Director of the Center for Lifelong Improvement in Minds and Brains (CLIMB), as well as of the Center for Nutrition, Learning, and Memory (CNLM), his work also examines the beneficial effects of cognitive, fitness, and nutritional interventions on memory performance and brain health.

**Eichenbaum Lab at Boston University:**
The research program of this laboratory investigates how the brain processes memories, using state-of-the-art neurophysiological tools to examine how information is encoded in components of the brain system that supports memory. We train rats on a task in which they learn the different values of specific objects in different contexts. As rats are learning, we monitor the activity of many individual neurons in key brain areas that support this type of learning, including the hippocampus and prefrontal cortex. Our analyses are directed at determining the nature of the memory code in each area, and how information flows between brain areas during the course of learning. In addition, we can briefly inactivate some of the areas that communicate between these and other brain areas to investigate how the information processing in one area depends on its inputs. Our main goal in this project is to increase our understanding of how the prefrontal cortex and hippocampus interact in support of memory. Students will learn to train rats on our memory task, and learn to fabricate our special recording electrodes, and how to analyze neurophysiological data.

**Hasselmo Lab at Boston University:**
Research on the Conte grant in the Hasselmo lab focuses on modeling the interactions of prefrontal cortex input with entorhinal representations for goal-directed behavior. We seek an undergraduate with extensive programming experience to develop MATLAB scripts focused on modeling how neural activity guides behavior. In particular, models of entorhinal grid cell firing based on the phase of oscillations will code location of a modeled animal (primate or rat), and this activity will interact with spiking activity in prefrontal cortex that represents behavioral context. The interaction of these systems will be used to model the generation of behavioral responses based on an interaction of context and current location.

**Miller Lab at Massachusetts Institute of Technology:**
We aim to understand how interactions between different brain regions support the flexible encoding and use of memories. Monkeys will learn associations between two pictures or between a picture and a behavioral response (such as “look right” or “look left”) that are dependent on where the pictures appear. For example, when an apple appears on the upper right of a computer screen, it will instruct the animal to look to one direction, whereas if the apple appears on the upper left, the animal will need to look to the other direction to get a reward. This ability to recode memories depending on their context is at the heart of something central to high-level cognition: Cognitive flexibility, the ability to switch behavior depending on the situation. For instance, we may answer our cell phone if we are alone but mute the ringing if we are in a lecture. Our lab will employ cutting-edge techniques to record the activity of many neurons simultaneously in two brain regions critical for the storage and flexible use of memory: The prefrontal cortex (the brain’s “executive”) and the hippocampus (a set of limbic system structures that store and consolidate new memories). This will provide new insight into the neural circuits within and between them that provide the infrastructure for memory and cognition.

**Shapiro Lab at Mount Sinai Hospital:**
Our lab studies the neural mechanisms of memory in the everyday sense of the word: the ability to learn new facts and remember recent events. My research focuses on how the hippocampus, prefrontal cortex, and other brain areas contribute to memory in experimental animals, mostly rats, and how mechanisms of neuronal
plasticity within these structures may underlie memory functions. Experiments in my lab are guided by cognitive, computational, physiological, and pharmacological hypotheses. The basic idea is that the properties of the NMDA receptor allows cells in the hippocampus to conjoin temporally overlapping cortical inputs into representations of events, and that recurrent connections within the hippocampus allow these events to be linked into the sequences that comprise episodic memories. Experiments investigating the links between these different levels of analysis are aimed toward providing an integrated perspective of memory. Doses of NMDA receptor antagonists that block the induction, but not expression, of long-term potentiation (LTP) in the hippocampus also impair learning, but not performance, in several tasks that require the hippocampus. We have found that persistent encoding of environmental information by hippocampal neurons also requires NMDA receptor dependent mechanisms. Thus, learning that requires the hippocampus, stable neural encoding within the hippocampus, and synaptic plasticity within the structure each depends upon NMDA receptor activation. We are now investigating the real-time firing patterns in groups of hippocampal neurons to test new hypotheses concerning how populations of these cells encode learned information.

**Stern Lab at Boston University:**
The Cognitive Neuroimaging Lab at Boston University is using functional and structural MRI to examine the interactions between medial temporal lobe regions and the prefrontal cortex. Summer students are given the opportunity to assist with fMRI task development, behavioral piloting, and fMRI preprocessing and data analysis. Students with a background in neuroscience and those with computer programming and MATLAB experience are encouraged to apply. Students must complete Human Research Training and IRB certification prior to joining the lab.

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**Lab Selection**

Please rank each of these lab experiences based on your interest level from the descriptions above.

1 = First Choice  
2 = Second Choice  
3 = Third Choice  
4 = Fourth Choice  
5 = Fifth Choice  
6 = Last Choice  

________ Cohen Lab  
________ Eichenbaum Lab  
________ Hasselmo Lab  
________ Miller Lab  
________ Shapiro Lab  
________ Stern Lab
Background Experience

Detail any previous research experience, applicable course work, or other relevant experience you may have.

Personal Statement

Please describe why this fellowship will be beneficial to your future career goals.

Academic and Professional Interest

Please describe your academic and professional interests including areas where you are interested in performing research.
Safety Trainings

Safety Training
All students working in laboratories that use various hazardous materials are mandated by the Office of Environmental Health and Safety to undertake training to work around those materials, whether or not they come in direct contact with them. Animal Safety courses are coordinated by the Laboratory Animal Care Facility.

Please indicate if you have previously had the below safety trainings. If none, your lab will arrange it this spring.

- **Laboratory Safety**  (   ) yes (   ) no already taken date:
- **Radiation Safety**  (   ) yes (   ) no already taken date:
- **Laser Safety**  (   ) yes (   ) no already taken date:
- **X-Ray Safety**  (   ) yes (   ) no already taken date:
- **Animal Safety**  (   ) yes (   ) no already taken date:
- **Human Research**  (   ) yes (   ) no already taken date:

For more information on specific safety trainings check out The Office of Research Compliance at [http://www.bu.edu/orctraining](http://www.bu.edu/orctraining)